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Carmen V. Nersinger

Carmen V. Nersinger

Date: January 9, 2004

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In Re Application of: Ralf Allner et al. Title: **DEVICE FOR BALANCING OF A RADIAL THREADED SPINDLE ECCENTRICITY OF A SPINDLE DRIVE** U.S. Serial No. 10/016,719 Filed: December 10, 2001	Examiner: Robert A. Siconolfi Group Art Unit: 3683 NexPress Solutions LLC 1447 St. Paul Street Rochester, NY 14653-7103

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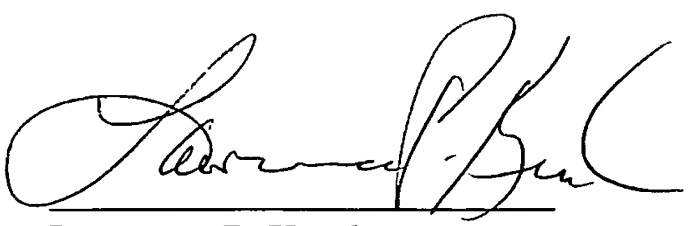
LETTER

Having filed a Notice of Appeal on December 5, 2003, the Appellant hereby submits the enclosed Appeal Brief in triplicate.

The Commissioner is hereby authorized to charge any fees in connection with this communication to NexPress Solutions LLC, Deposit Account No. 50-1466.

A duplicate copy is submitted herewith.

Respectfully submitted,



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APPELLANT'S BRIEF

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TABLE OF CONTENTS

APPELLANT'S BRIEF

I. REAL PARTY IN INTEREST

The real party in interest is NexPress Solutions LLC, 1447 St. Paul Street, Rochester, New York 14653-7103.

II. RELATED APPEALS AND INTERFERENCES

There are no related appeals, or interferences, known to Appellant, Appellant's legal representative, or Assignee, which will directly affect, or be directly affected by, or have a bearing on the Board's decision in the pending Appeal.

III. STATUS OF THE CLAIMS

The pending Claims 1, 2, 4-11, and 13, in the instant Application here on Appeal, have been finally rejected under 35 U.S.C. §103(a), as set forth in the Final Office Action mailed September 5, 2003. These claims are the only claims present in the instant Application. This Appeal is specifically taken from the Final Rejection of Claims 1, 2, 4-11, and 13, as amended, and covers all such claims.

IV. STATUS OF THE AMENDMENTS

There have been no amendments filed subsequent to the Final Rejection.

V. SUMMARY OF THE INVENTION

The following description according to Figures 1 to 5 refers to a preferred variant of the device according to the invention for balancing of a threaded spindle eccentricity in order to avoid blocking or jamming of a spindle drive 1 having several spindles, which is provided for lifting movement of a platform 2 carrying a sheet stack S of a sheet feed magazine in an ordinary sheet processing machine (not shown), for example, a copier. Individual sheets can be automatically removed in succession from the sheet stack lying or positioned on the platform by an ordinary sheet removal/transport unit of the copier (not shown) and fed to one or more sheet processing stations of the copier.

It is self-evident to one skilled in the art active in this field that the device according to the invention can also be used in other machines, for example, in delivery or feed devices for cards or other stackable objects, as well as in printers or sheet machines.

The device according to the invention having a spindle drive 1, depicted in Figure 1 in a three-dimensional schematic view through an opening of a machine housing 5, has an upper 51 and a lower 52 essentially rectangular bearing plate 2 within the machine housing 5 with four spindles mounted between them in axiparallel, vertical alignment on four corner points of the bearing plates 5l; 52 in the form of threaded spindles G1; G2; G3; G4. The upper bearing plate 51 has a recess for access to the top of sheet stack S by band and/or by sheet removal/transport unit, so that only an edge region of the bearing plate remains in the form of a U.

The platform 2 is mounted on corresponding threaded spindle G1; G2; G3; G4 by four bearing devices L1; L2; L3; L4 arranged on it, which according to Figure 2 have different radial bearing clearance Fl; F2 in the horizontal directions X, Y.

To hold and guide the sheet stack S, as shown in Figures 2 and 5, several adjustable side stops 23 and rear stops 24 are made on a bottom plate 20 arranged on platform 2, which extend in the lifting direction and act laterally on the sheet stack. These stops are omitted in Figure 1 for a clearer depiction of the invention.

Platform 2 can be lifted together with the bearing devices axially along the spindles vertically in direction Z, for which purpose all threaded spindles G1; G2; G3; G4 of the spindle drive 1 can be driven to rotate synchronously by a single microprocessor-control drive unit 6. The drive unit 6 is controllable by an ordinary control unit and sensor unit (not shown) of the copier in its rotational direction and rotation time and has a drive motor 60 with a drive pinion, as well as a drive belt 61 in the form of a toothed belt that can be driven over the drive pinion. The toothed belt 61 then moves around all pulleys 62 which are arranged concentrically on the threaded spindles G1; G2; G3; G4 in the region of the lower bearing plate 52 and connected rigidly to them.

In the preferred variant of the invention according to Figures 1 and 2 a first bearing device L1 of the platform is arranged essentially radially and free of clearance on a first spindle G1, a second bearing device L2 according to Figures 1 to 4a has a radial bearing clearance Fl on both sides of the second spindle G2 in direction Y,

which is prescribed to run radially linear back-and-forth from the first spindle G1 and the third and additional bearing devices L3, L4 according to Figures 1, 2, 4b and 4c are arranged with bearing clearance F2 effective all the way around (in directions X and Y) the corresponding third and additional spindles G3, G4. During the lifting movement of platform 2 during a spindle eccentricity of threaded spindles G1-G4, a horizontal movement of platform 2 is obtained in direction X or across the transport direction T of sheet S (see Figure 2), which is determined by the spindle eccentricity of the threaded spindle G1 and G2 and a horizontal movement in direction Y or along the transport direction T, which is only determined by the spindle eccentricity from threaded spindle G1.

The bearing devices L1; L2; L3; L4 of platform 2 are arranged in the variant according to the invention as low-friction bearing devices with radial clearance Fl; F2 to balance the radial eccentricity of the rotating threaded spindles G1; G2; G3; G4 so that a relative radial movement of the rotating spindles G1; G2; G3; G4 to platform 2 is possible with limited friction force and limited force expenditure. As shown in Figures 3, 4a and 4c, the bearing devices L1; L2; L3; L4 then each have an annular ball bearing 3 arranged concentrically around spindles G1; G2; G3; G4, by which the radial bearing clearance Fl and F2 between platform 2 and the spindles can be produced to balance the threaded spindle eccentricity in low-fiction fashion.

As shown in Figures 3, 4a-4b, each ball bearing 3 has a first plane lower annular bearing shell 31 aligned perpendicular to the lifting movement and a second plane upper annular bearing shell 32 aligned plane-parallel to the first; between which, the balls 34 of the ball bearings, held by an annular cage 33; 33.1; 33.2 are mounted to rotate freely, the first bearing shell 31 of ball bearing 3 being rigidly connected to a corresponding spindle nut M1; M2; M3; M4 of the bearing devices L1; L2; L3; L4 and the second bearing shell 32 being rigidly connected to platform 2.

The bearing shells 31; 32 have a plane support width for balls 34 in the radial direction, which is larger than the maximum radial bearing clearance Fl; F2 predetermined by the maximum spindle eccentricity and the ball cage 33 has an outer 33.1 and an inner 33.2 annular element around the balls 34 in a concentric arrangement around spindles G1; G2; G3; G4 and around the spindle nuts Ml; M2; M3; M4, the inner annular element 33.2 having an inside diameter that essentially corresponds to the outside diameter of spindle nuts Ml; M2; M3; M4.

In an alternative variant according to Figure 4c, the bearing devices L1; L2; L3; L4 each have an alternative annular ball bearing 4 arranged concentrically around a threaded spindle G1; G2; G3; G4, which has a first lower, concave, ball-guiding bearing shell 41 of ball bearing 4, which is rigidly connected to a corresponding spindle nut M1; M2; M3; M4 of bearing device L1; L2; L3; L4, and whose second, upper bearing shell 42 is connected in a plane-parallel position relative to the first bearing shell 41 to platform 2 and has a plane support side for the freely rotating balls 44 of ball bearing 4.

The spindle nuts M1; M2; M3; M4 arranged on the threaded spindles G1; G2; G3; G4 and liftable by rotation of the spindle, as shown in Figures 4a and 4b, have a cylindrical shape or a cylindrical shaft extending axially to the axis of rotation of the spindle, a radially protruding cylindrical flange being applied concentrically on the lower end of each spindle nut. The lower/first annular bearing shell 31 is arranged lying on this flange of the spindle nut, centered by a concentric annular element of the flange having a smaller diameter and rigidly connected to the flange (for example, by press fitting from the inside periphery of bearing shell 31 to the outside periphery of the annular element).

Each upper/second annular bearing shell 32 of ball bearing 33 is rigidly arranged on a bottom of platform 2 or its bearing sites L1; L2; L3; L4 in the region of a passage opening to the corresponding spindles G1; G2; G3; G4 in an annular recess, for example, by press fitting from the outside periphery of bearing shell 32 to the inside periphery of the recess of platform 2. The upper bearing shell 2 of ball bearing 3 and the spindle passage opening on platform 2 have an inside diameter of their passage opening whose radius is greater by the amount of required predetermined radial bearing clearance Fl; F2 of the individual bearing sites of the bearing devices L1; L2; L3; L4 than a radius of the outside diameter of the upper cylinder shaft of spindle nuts M1; M2; M3; M4 protruding upward through the passage openings. The outside diameter of the upper cylinder shaft of the spindle nut then also serves for centering and guiding of the inner annular element 33.2 of the annular ball cage 33.

A limitation of the radial bearing clearance Fl; F2 between bearing devices L1; L2; L3; L4 of the bearing sites or platform 2 and the spindles G2; G3; G4 and the spindle nuts M1; M2; M3; M4 can be produced by limiting devices 21; 22 of platform 2 arranged on platform 2 and engaging the spindle nuts radially outward, i.e., the

inside edge of the spindle passage openings on the bearing sites L2; L3; L4 is a limiting device 21; 22 for the radial bearing clearance Fl; F2.

In order to guarantee that the spindle nuts M1; M2; M3; M4 and thus the platform 2 can be moved upward and downward in one lifting movement, i.e., the spindle nuts are not co-rotated with the threaded spindles G1; G2; G3; G4, the spindle nuts are loosely coupled to the bearing sites L1; L2; L3; L4 or to platform 2 by holding devices, for example, in the form of mounting bolts 25 (see Figure 3). For this purpose, the mounting bolt 25 is connected rigidly to the cylinder shaft of spindle nuts M2; M3; M4 and protrudes with its opposite end, freely mobile in the axial direction (according to the varying play Fl) through a guide hole on a connector 26 of the platform or within the platform-bearing site L2; L3; L4. The guide hole is then chosen in diameter large enough that the radial bearing clearance F2 is guaranteed through the circular horizontal movement of the mounting ball 25. An exception is the bearing site L1 with spindle nut Ml, since this spindle nut can be rigidly and directly connected with its cylinder shaft to platform 2 because of the predetermined bearing site L1 free of clearance.

In another variant of the invention depicted in Figure 5, ball bearing devices L1; L2; L3; L4 of platform 2 arranged on the threaded spindles G1; G2; G3; G4 and spindle nuts M1; M2; M3; M4 have identical or also non-identical/different bearing clearance F2 that acts radially all the way around. For limitation of the radial bearing clearance F2 between the bearing devices 3; M1; M2; M3; M4 of the bearing sites L1; L2; L3; L4 and the spindles G1; G2; G3; G4 and to avoid horizontal radial movement of platform 2 in the X/Y direction during its lifting movement, fixed limiting devices 50 on the apparatus side are arranged, which engage at right angles to the lifting movement on all four sides of the platform 2 or on the bottom plate 20 for the sheet stack stops 23; 24. The limitation devices 50 are, for example, ribs or connectors, as a component of the spindle drive housing 5 and extend over the entire lifting height of platform 2 along the lifting movement.

VI. ISSUES

In the Office Action mailed September 5, 2003, the Examiner has finally rejected Claims 1, 2, 4-11, and 13 under 35 U.S.C. §103(a) as being unpatentable over Bayne et al. (U.S. Patent No. 4,326,643) in view of Joffe (U.S. Patent No. 5,331,861). Accordingly, the issue to be resolved is the propriety of the combination of the cited references and the applicability of the combination in forming the basis for the rejection of the appealed claims as being unpatentable over such cited references.

VII. GROUPING OF THE CLAIMS

Pending Claims 1, 2, and 4-6 stand or fall together, and separately, pending Claims 7-11 and 13 stand or fall together.

VIII. ARGUMENTS

The Examiner has rejected Claims 1, 2, 4-11, and 13, appealed herein, under 35 U.S.C. §103(a) as being unpatentable over Bayne et al. (U.S. Patent No. 4,326,643) in view of Joffe (U.S. Patent No. 5,331,861). The reference to Bayne et al., shows an apparatus including a ticket container having a platen vertically movable by a spindle. The Examiner, in Paragraph 3 of the Final Office Action, concedes that the Bayne et al. reference does not disclose the use of several (more than one) threaded spindles, and concludes, without any factual support, that the number of spindles is merely a design choice. He further opines that the use of multiple spindles is a "duplication of parts, which is patentable only if unexpected results are discovered". Moreover, in Paragraph 4 of the Final Office Action, the Examiner argues that additional spindles would have the expected affect of smoother operation, and "as a corollary, the prevention of binding of the lead screws".

It is respectfully submitted that the use of several threaded spindles, instead of a single threaded spindle, cannot be summarily dismissed as a design choice or duplication of parts as set forth by the Examiner. The inclusion of additional threaded spindles does not necessarily provide smoother operation, nor does it prevent binding. While it certainly distributes the load, it in fact, presents the possibility of a significant problem of spindle binding, where lateral movement of one spindle can cause binding of any other spindle in a multi-spindle configuration. This problem, which is the very essence of Appellant's invention, must be solved to permit multi-spindle use. The

very fact that the prior art fails to show, or in any way teach, multiple threaded spindles is a clear indication that the art is tending away from multi-spindle usage, and adding spindles is not merely a design expedient or a simple duplication of parts, but requires the very "unexpected results" referred to by the Examiner as indicative of patentability. That is, the multi-spindle arrangement, an important aspect of Appellant's invention, with low-friction bearings having radial clearance, yields the unexpected result of preventing blocking (binding) of the spindles as the platform is elevated.

In independent Claim 1 (and Claims 2 and 4-6 dependent thereon), Appellant's invention is specifically recited as being drawn to several axiparallel spindles with bearings having low-friction and radial clearance. In independent Claim 7 (and Claims 8-11 and 13 dependent thereon), Appellant's invention is specifically recited as being drawn to axiparallel spindles with bearings with low-friction annular ball bearings with radial clearance. Accordingly, in view of the above discussion, it must be reasonably concluded that Appellant's invention, as recited in the claims herein on appeal, patentably distinguishes over the reference to Bayne et al.

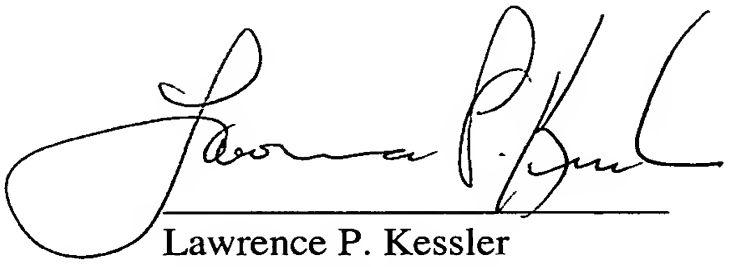
The Examiner has cited the Joffe reference to show a spindle (lead screw) having a ball-bearing connection between a movable nut and supported work piece. The Examiner contends, in Paragraph 3 of the Final Office Action that it would be obvious to use the ball bearings of the Joffe reference to allow for better operation of the device of the Bayne et al. reference. There is no definitive motivation shown in the prior art to indicate that such a combination would be in order. The device of the Bayne et al., reference has it's own element (referred to as floating nut 31) to fully accommodate for lateral spindle movement in such an arrangement. Therefore, there would be no need, which would require incorporation of a ball bearing device such as the ball bearings of the Joffe reference.

Moreover, and most importantly, the Joffe reference offers no hint that the single threaded spindle could be a multi-spindle arrangement. Thus, even if it were admitted *arguendo* that the ball bearings of the Joffe reference could be combined with the threaded spindle of the Bayne et al., reference, there would still be no teachings, which would suggest the multi-spindle device of Appellant's invention, as specifically recited in the claims appealed herein. Accordingly, Appellant's invention would not be obvious to one of ordinary skill in the art in view of the cited references

either individually or in any proper combination thereof. Therefore, independent Claims 1 and 7, and Claims 2, 4-6, 8-11, and 13, dependent directly or indirectly thereon, should now be allowed.

IX. SUMMARY

The references relied on by the Examiner cannot be properly combined in any manner which would teach, or make obvious to one of ordinary skill in the art, Appellant's invention as claimed in the claims herein on appeal. As a whole, in view of the applied prior art, or any other prior art known to Appellant, no references have been shown which alone, or in any proper combination, would render Appellant's invention obvious to one of ordinary skill in the art. Accordingly, the appealed Claims 1, 2, 4-11, and 13 patentably distinguish over the prior art. Therefore, the Examiner's final rejection under 35 U.S.C. §103(a) is improper, and it is respectfully requested that such rejection should be reversed and the appealed Claims 1, 2, 4-11, and 13 now allowed.



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APPENDIX

1. **(As Amended)** Device for balancing of radial eccentricity of a spindle drive (1) to avoid blocking of the spindle drive during lifting movement of a platform (2), comprising: a platform for lifting objects (S) said platform being mounted by several bearing devices (L1; L2; L3; L4) respectively arranged on several axiparallel spindles (G1; G2; G3; G4), lifted axially along the spindles together, said bearing devices (L1; L2; L3; L4) having respective radial bearing clearances (Fl; F2) in a polygonal arrangement; and said bearing devices (L1; L2; L3; L4) being of a low-friction type, and arranged with radial bearing clearance (Fl; F2) to balance the radial eccentricity of the rotating threaded spindle so that a relative radial movement of the rotating spindles to platform (2) with limited friction force is possible.

2. **(As Amended)** Device according to Claim 1, wherein a first bearing device (L1) of platform (2) arranged essentially radially on a first spindle (G1) free of play, a second bearing device (L2) having a radial bearing clearance (Fl) on both sides of a second spindle (G2), which is prescribed to run radially and linearly back-and-forth from the first spindle (G1), and a third bearing device (L3, L4) arranged with radial bearing clearance (F2) that is active all the way around the third spindle (G3, G4).

4. **(As Amended)** Device according to Claim 1 wherein said bearing devices (LI; L2; L3; L4) each having an annular ball bearing (3) arranged concentrically around the spindle (G1; G2; G3; G4) by which the radial bearing clearance (Fl; F2) between platform (2) and the spindle can be produced substantially free of friction to balance threaded spindle eccentricity.

5. **(As Amended)** Device according to Claim 2, wherein limitation of the radial bearing clearance (Fl; F2) between bearing devices (L2; L3; L4) and respective spindles (G2; G3; G4) being produced by limitation devices (21; 22) arranged on platform (2) and engaging the spindles radially.

6. **(As Amended)** Device according to Claim 2, wherein for limitation of the radial bearing clearance (F2) between the bearing devices (L1; L2; L3; L4) and the spindles (G1; G2; G3; G4) and to avoid radial movement of the platform (2), fixed limitation devices (50), arranged on the apparatus side, said fixed limitation devices (50) engage at right angles to the lifting movement on all four sides of platform (2).

7. **(As Amended)** Device for balancing of radial eccentricity of a spindle drive (1) in order to avoid blocking of the spindle drive during lifting of a platform (2), comprising: a platform for lifting objects (S) in a machine, said platform being mounted by several bearing devices (L1; L2; L3; L4) respectively arranged on several axiparallel spindles (G1; G2; G3; G4), lifted together with the bearing devices axially along the spindles, said bearing devices (L1; L2; L3; L4) each having an annular ball bearing (3) arranged concentrically around the spindles (G1; G2; G3; G4) by which a radial bearing clearance (Fl; F2) can be produced between said platform (2) and the spindles to balance the threaded spindle eccentricity in low-friction fashion.

8. **(As Amended)** Device according to Claim 7, wherein said ball bearings (3) each having a first plane bearing shell (31) aligned at right angles to the lifting movement and a second plane bearing shell (32) aligned plane-parallel to said first plane, between which, the balls (34) of each ball bearing are held by an annular cage (33; 33.1; 33.2) and mounted to rotate freely, said first plane bearing shell (31) being rigidly connected to a corresponding spindle (M1; M2; M3; M4), and said second plane bearing shell (32) being rigidly connected to said platform (2).

9. **(As Amended)** Device according to Claim 8, wherein said plane bearing shells (31; 32) having a plane support width in the radial direction for said balls (34), which width is greater than the maximum radial bearing clearance (F1; F2) predetermined by the maximum spindle eccentricity, and said ball cage (33; 33.1; 33.2) having an outer (33.1) and an inner (33.2) annular element around said balls (34), in a concentric arrangement around said spindles (G1; G2; G3; G4), the inner annular element (33.2) having an inside diameter that essentially corresponds to an outside diameter of said spindle (M1; M2; M3; M4).

10. **(As Amended)** Device according to Claim 7, wherein said bearing devices (L1; L2; L3; L4) each have an annular ball bearing (4) arranged concentrically around a respective threaded spindle (G1; G2; G3; G4), a first concave, ball-guiding bearing shell (41) of said annular ball bearing being rigidly connected to a spindle (M1; M2; M3; M4), and a second bearing shell (42) rigidly connected to said platform (2) in a plane-parallel position relative to said first bearing shell (41), and a plane support side for said balls (44) of said ball bearing (4).

11. **(As Amended)** Device according to Claim 10, wherein all threaded spindles (G1; G2; G3; G4) of the spindle drive (1) are driven synchronously by a single microprocessor-controlled drive unit (6); and said platform (2) has a vertically directed lifting movement.

13. **(As Amended)** Device according to Claim 11, wherein said spindles (G1; G2; G3; G4) have a combination of threaded spindles and cylinder shafts, said cylinder shafts being used for guiding, and as rotational and tilting protection for, said platform (2).